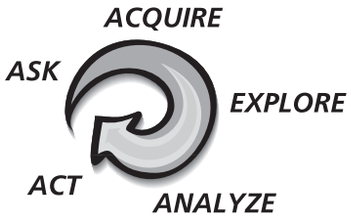
NAME _____ DATE _____

Seasonal Differences

A GIS investigation



Answer all questions on the student answer sheet handout

In this activity, you will analyze the variable patterns of precipitation in South Asia that result from the region's seasonal monsoon winds. As you investigate those patterns, you will explore relationships between rainfall and physical features and analyze the climate's impact on agriculture and population.

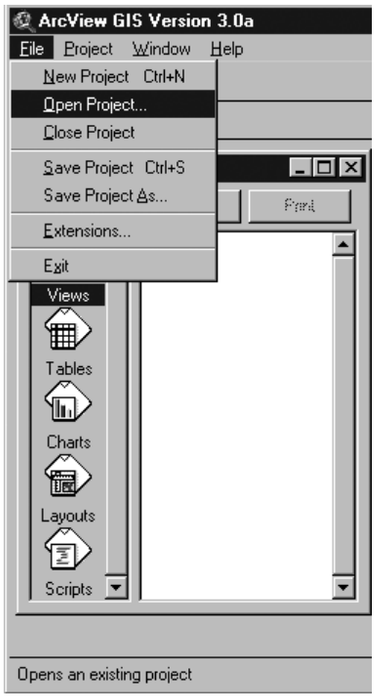
Step 1 Start ArcView

a **Double-click the ArcView icon on your computer's desktop.**

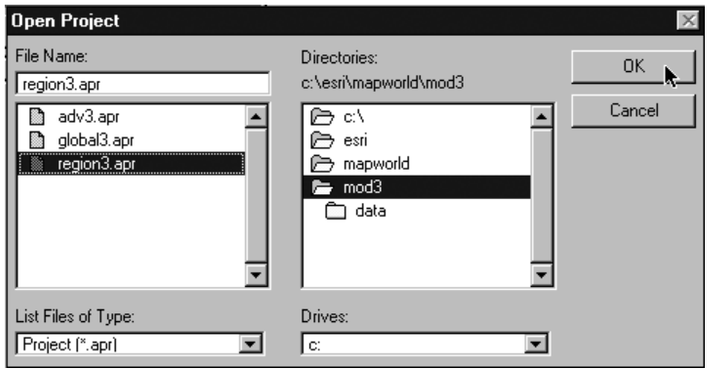
b **If the Welcome to ArcView dialog appears (pictured below), click Open an Existing Project and click OK. If it doesn't appear, proceed to step 2.**

Step 2 Open the region3.apr file

a In this exercise, a project file has been created for you. To open the file, go to the **File** menu and choose **Open Project**.

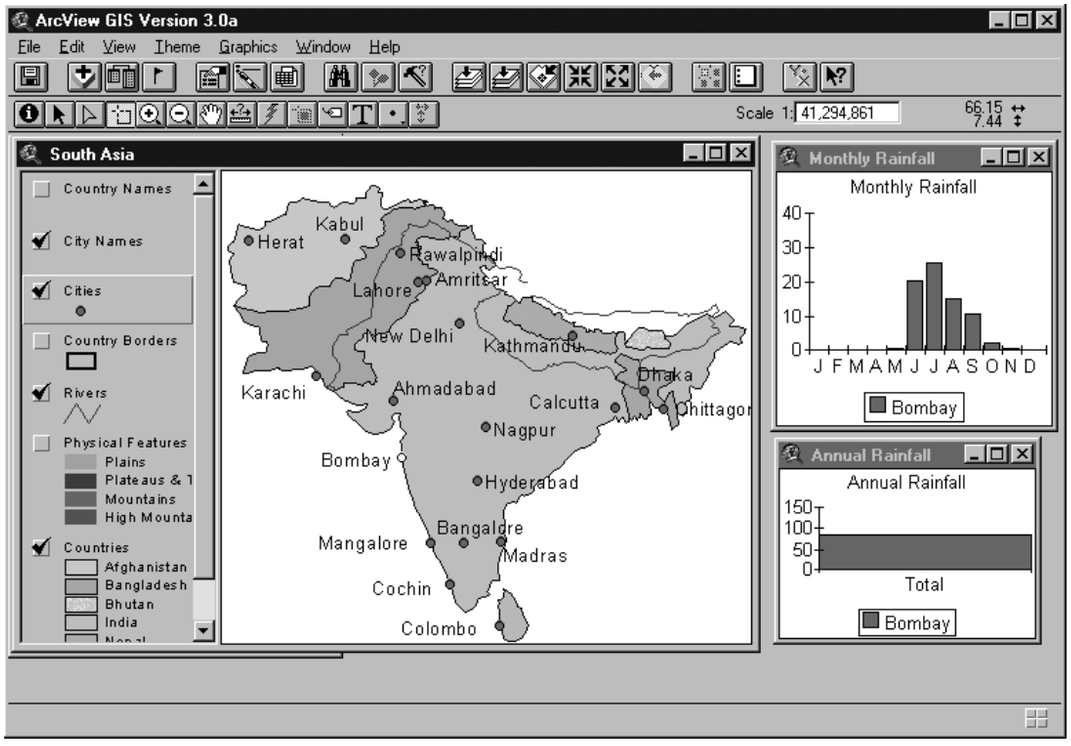


b Navigate to the exercise data directory (**C:\esri\mapworld\mod3**) and choose **region3.apr** from the list.



c Click OK.

When the project opens, you see three open windows: a view called South Asia, a chart called Monthly Rainfall, and a chart called Annual Rainfall.



Note: In ArcView, graphs are referred to as charts.

d Click the Maximize button in the upper right corner of your ArcView window.

e Move the charts over to the right and stretch the View window to make the map bigger.

Step 3 Observe patterns of rainfall

The map in this project allows you to explore and compare variations in the patterns of rainfall throughout the South Asian region. Look at the map and notice that the city of Bombay is selected—it is highlighted yellow. The charts to the right display rainfall information for the selected city—in this case, Bombay.

a Analyze the charts and answer the following questions on your answer sheet.

(1) Which month gets the most rainfall in Bombay?

(2) Which months appear to get little or no rainfall in Bombay?

(3) Approximately how much rainfall does Bombay get each year (in inches)?

(4) Write a sentence summarizing the overall pattern of rainfall in Bombay in an average year.

b Click the Select Feature tool. Click a dot for another city.

(1) How did this change the map?

(2) How did this change the charts?

c Click the city of Mangalore to select it in the map.

Analyze the charts and fill in the Mangalore section of the table on your answer sheet.

d Hold the Shift key down and click the cities of Bombay and Ahmadabad.

(1) Complete the table on the answer sheet.

(2) As you move northward along the subcontinent's west coast, how does the pattern of rainfall change?

(3) Although the monthly rainfall amounts *differ, what similarities do you see among the overall rainfall patterns of these three cities?*

Step 4 Compare coastal and inland cities

a Make sure the Select Feature tool is still active and select Bangalore.

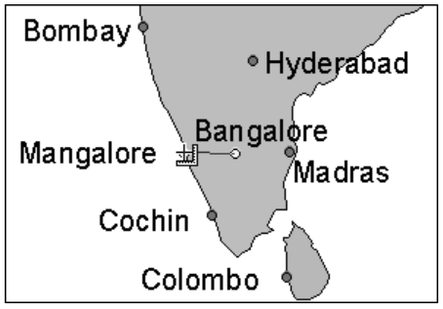
Use the Monthly Rainfall and Yearly Rainfall charts to complete the table on your answer sheet.

b Hold down the Shift key and select Mangalore.

How does the rainfall pattern of Bangalore compare with that of Mangalore?

c Click the Measure tool. Your cursor turns into a right-angle ruler with crosshairs.

d Click the dot that represents Bangalore once, then move it to the dot that represents Mangalore and double-click.



Note: If you accidentally clicked the wrong spot, you can double-click to end the line and start over.

A segment length appears on the bottom left of the View window.

What is the distance between the two cities?

Although Bangalore is located only a short distance inland from Mangalore, it receives far less rainfall than the coastal city.

e Turn on the Physical Features theme.

How can this data help you explain the differences between patterns of rainfall in inland Bangalore and coastal Mangalore?

f Turn off Physical Features and make sure Cities is the active theme.

Step 5 Compare eastern and western Asian cities

a Click the Select Feature tool. One at a time, select the Afghan cities of Kabul and Herat.

(1) Analyze the charts and complete the table on your answer sheet.

(2) Describe the pattern of rainfall in these two cities.

(3) How do you think Afghanistan's rainfall pattern will affect the way of life in that country?

b Select the eastern cities of Calcutta and Dhaka.

(1) Analyze the charts and complete the table on your answer sheet.

(2) Describe the pattern of rainfall in these two cities.

c Hold down the Shift key and select four cities (Calcutta, Dhaka, Herat, and New Delhi).

What is happening to the patterns of rainfall as you move from west to east across South Asia?

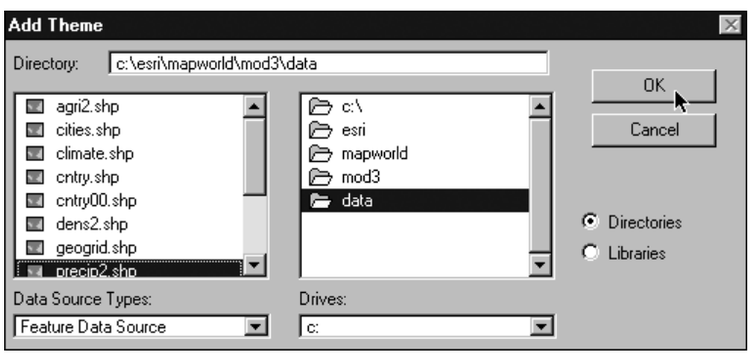
d Clear all of your selections and stretch the View window so it's much larger and partially covering the charts.

Step 6 Observe yearly precipitation

You've already looked at the monthly precipitation patterns for individual cities across South Asia. In this step, you will add data and look at the total yearly rainfall for regions of South Asia.

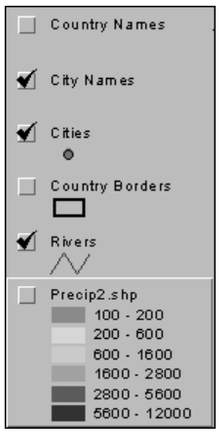
a Click the Add Theme button.

b Navigate to the data directory (**C:\esri\mapworld\mod3\data**).



c Scroll down and select **precip2.shp**. Click OK.

d **Drag the new theme, Precip2.shp, down in the table of contents so that it is just below the Rivers theme.**



e **Click the Theme Properties button.**

f **Change the theme name to Yearly Rain(mm) and click OK.**

g **Turn off the Cities and City Names themes and turn on Yearly Rain (mm).**

(1) Which regions within South Asia get the least rainfall?

(2) Which regions within South Asia get the most rainfall?

(3) In step 5c you were comparing Calcutta, Herat, New Delhi, and Dhaka. Does the map of yearly rainfall that is on your screen now reflect the observation you made at that time? Explain.

h **Turn off Yearly Rain (mm) and turn on Physical Features.**

What relationships do you see between South Asia's patterns of yearly rainfall and its physical features?

Step 7 Explore the monsoon's impact on agriculture and population density

a **Turn on the Country Borders and the Country Names themes.**

The rain patterns and physical features of an area have a significant impact on the way of life of the people who live there. Now you will look at those themes and determine the kind of impact they have on individual countries.

b **Turn the Physical Features and Yearly Rain themes on and off to make your observations and to answer the questions below.**

(1) Which regions or countries of South Asia are suitable for agriculture and which are not? Explain.

(2) In which regions of South Asia do you expect to see the lowest population density? Explain.

(3) In which regions of South Asia do you expect to see the highest population density? Explain.

c **Turn off Physical Features and Yearly Rain (mm) themes.**

Now you will add agricultural data for the region and will see if your predictions are correct.

d Click the Add Theme button.

e Navigate to the data directory (**C:\esri\mapworld\mod3\data**).

f Select **agri2.shp**. Click OK.

g Click the Theme Properties button.

h Change the theme name to **Agriculture** and click OK.

i Make the table of contents window wider so that you can read the entire legend label. Do this by slowly moving your cursor to the line that separates the table of contents from the View window. When the cursor turns to a double arrow symbol, hold down the mouse button and drag the line to the right.

j Drag Country Borders and Rivers to the top of the table of contents. Turn on the Agriculture theme.

(1) *Does the Agriculture theme reflect the predictions you made in step 7b? Explain.*

(2) *Why are grazing, herding, and oasis agriculture the major activities in Afghanistan?*

(3) *What do you know about rice cultivation that would help explain its distribution on the agriculture map?*

(4) *Is there any aspect of the agriculture map that surprised you? Explain.*

k Turn off the Agriculture theme.

You will now examine population density in relation to precipitation and land use.

l Click the Add Theme button.

m Navigate to the data directory (**C:\esri\mapworld\mod3\data**).

n Select **dens2.shp**. Click OK.

o Change the theme name for Dens2.shp to **People/sq. km**.

p Drag Country Borders and Rivers to the top of the table of contents. Turn on People/sq.km.

(1) *Does the People/sq km theme reflect the population predictions you made in step 7b? Explain.*

(2) *Why is Afghanistan's population density so low?*

(3) *Since most of Pakistan gets little to no rainfall, how do you explain the areas of high population density in that country?*

(4) *What is the relationship between population density and patterns of precipitation in South Asia?*

(5) *What is the relationship between population density and physical features in South Asia?*

Step 8 Exit ArcView

In this GIS Investigation, you explored the patterns of monsoon rainfall in South Asia. You used ArcView to compare monthly and annual patterns of precipitation in cities throughout the region and explore the relationship between those patterns and the region's physical features. After analyzing this data, you added themes reflecting patterns of agriculture and population density and analyzed the relationship between those human characteristics and the region's climate and landforms.

a **Ask your teacher for instructions on where to save this ArcView project and on how to rename the project.**

b **If you are not going to save the project, exit ArcView by choosing Exit from the File menu. When it asks if you want to save changes to region3.apr, click No.**